PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

28/10

see form PCT/ISA/220

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)* see form PCT/ISA/210 (second sheet)	
Applicant's or agent's file reference see form PCT/ISA/220	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/IB2004/001073	22.03.2004	17.04.2003

International Patent Classification (IPC) or both national classification and IPC
H03G3/30

Applicant
KONINKLIJKE PHILIPS ELECTRONICS N.V.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:	Authorized Officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Trafidlo, R Telephone No. +49 89 2399-2672

Form PCT/ISA/237 (Cover Sheet) (January 2004)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/IB2004/001073

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was field, unless otherwise indicated under this item.

   ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material:

   ☐ a sequence listing

   ☐ table(s) related to the sequence listing

   b. format of material:

   ☐ in written format

   ☐ in computer readable form

   c. time of filing/furnishing:

   ☐ contained in the international application as filed.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

Box No. II Priority

1. ☒ The following document has not been furnished:

   ☒ copy of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(a)).

   ☐ translation of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(b)).

   Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.

3. Additional observations, if necessary:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-10
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-10
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-10
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Claims 1 and 8 are not clear within the meaning of Article 6 PCT.

The term "divider" used in claim 1, line 9 and in claim 8, line 18 is vague and unclear and leaves the reader in doubt as to the meaning of the technical feature to which it refers, thereby rendering the definition of the subject-matter of said claims unclear. From the description (cf. page 10, in particular lines 2 and 16) it results that the term "attenuator" should have been used and no alternative meaning (such as a frequency divider etc.) is envisaged.

2. Reference is made to the following documents:

D1: EP-A-0 838 896 (NIPPON ELECTRIC CO) 29 April 1998 (1998-04-29)
D2: EP-A-0 797 299 (NIPPON ELECTRIC CO) 24 September 1997 (1997-09-24)
D3: US-A-5 940 143 (MIZUKAMI HIROYUKI ET AL) 17 August 1999 (1999-08-17)
D4: GB-A-2 334 162 (MOTOROLA LTD) 11 August 1999 (1999-08-11)

3. Document D1, which is considered to represent the most relevant state of the art with respect to clarified claim 1, discloses (cf. D1: abstract, figure 5, column 7, line 33 - column 8, line 11):

> Method for increasing the sensitivity of a chain of amplifiers that comprises the steps of: amplifying a signal by means of a first amplifier (67) with a variable gain factor A_1, further amplifying the signal by means of a second amplifier (73) with a controllable gain factor A_2, where variations of the gain of the first amplifier are compensated by adjusting the gain A_2 of the second amplifier, so that the difference between the chain gain factor $A_C=A_1*A_2$ and a target chain gain factor A_T becomes 0.

from which the subject-matter of clarified claim 1 differs in that:

The signal at the output of the second amplifier is additionally fed into an attenuator that applies a fixed gain factor $A_3 \leq 1$ to its input, that variations of the gain factor A_1 of the first amplifier as well as the fixed gain factor A_3 are at least partially compensated by the gain factor A_2 of the second amplifier, so that the difference between the chain gain factor $A_C' = A_1 * A_2 * A_3$ and the target chain gain factor A_T becomes minimum, and that the fixed gain factor A_3 is chosen so that there exist at least some combinations of values A_1 and A_T for which said difference can be forced to zero, and some combinations for which said difference can no longer be forced to zero due to the upper limit of the value of A_2.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as to provide an alternative method of increasing the sensitivity of a chain of amplifiers, particularly if it suffers from gain factor variations.

The solution to the problem disclosed in document D1 is to control the first variable gain amplifier in the chain so as to prevent deterioration of the receiving sensitivity caused by cross modulation, to decrease the noise index of the entire receiver by inserting a high-frequency amplifier having a relatively large fixed gain and to keep the input power level to the demodulator constant by adjusting the gain of the last amplifier in the chain. Documents D2 and D3 propose alternative methods for improving the SNR and thus the sensitivity of a chain of amplifiers by adjusting the gain of amplifiers in the chain in a predetermined order, taking account of the fact that the chain noise figure is mainly affected by the noise figure of the first amplifier. Document D4 proposes controlling individual gains of amplifiers in the chain based on analysis of signal levels at various nodes of the chain as well as of the error signal with the aim to achieve an optimum SNR and to limit intermodulation distortion.

The solution to the problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:
none of the available prior art documents disclose or suggest incorporating an attenuator at the end of a chain of amplifiers which allows to shift the operating point of the preceding amplifier, so that the effective gain of the combination of the preceding amplifier and the attenuator is equal to the gain of a standalone amplifier but the effective noise figure of the combination is substantially lower than that of a standalone amplifier due to the fact that the noise figure of an amplifier decreases with increasing

gain.

Claims 2 - 7 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

The above reasoning applies analogously to the clarified independent apparatus claim 8 and claims 9 - 10 which are dependent on claim 8. Hence, claims 8 - 10 also satisfy the criteria of novelty and inventive step set forth in Articles 33(2) and 33(3) PCT.